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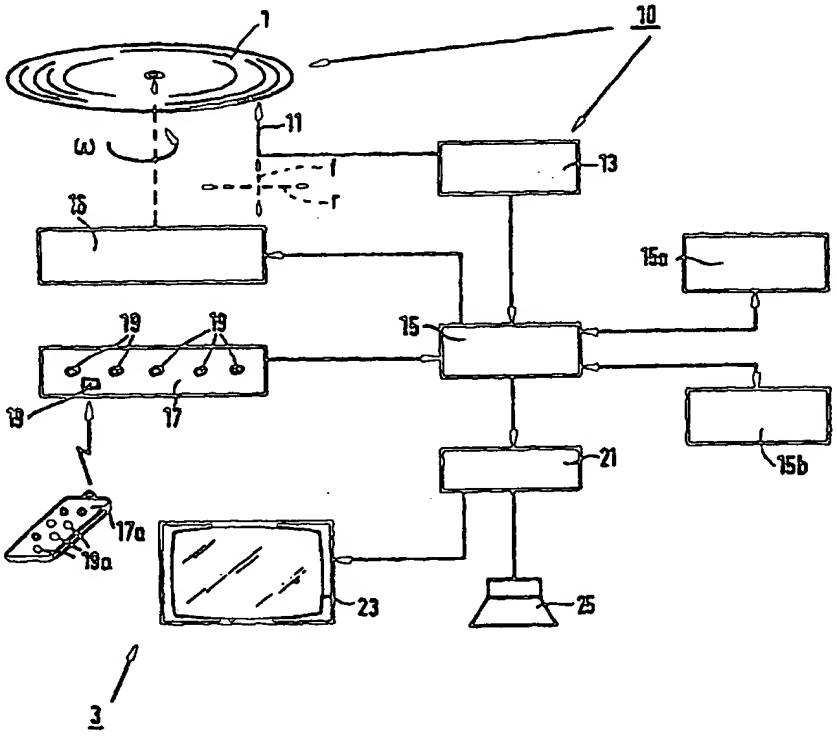
(54) Title: PLAYBACK CONTROL IN DIGITAL VIDEO DISC PLAYERS

(57) Abstract

A record carrier and apparatus for reproducing audio/video information stored on said record carrier are described, which by use of control structures stored on said disc and cooperating with the playback control mechanism enable a flexible and interactive control and display of the audio/video information. The processing power of the processor for said playback control is kept restricted and the complexity of the control structures are low. These structures include list such as: Play-, Regional Play-, Selection-, Statement-, Conditional-, Control- and Change Volume Lists. These lists enable interactive control, creation of wait loop for receiving user input, default actions or sequences, operation on variables and system variables to reproduce of audio/video information under certain settings of the player, such as conditional playback, multi channel sound, language selection, subtitle electron, etc.



PLAYBACK CONTROL IN DIGITAL VIDEO DISC PLAYERS

The invention relates to an apparatus capable of reproducing audio and/or video and/or data information from a record carrier, on which the information has been stored in digital form and is directly accessible, the apparatus being provided with control means for enabling the user to select and control a presentation of an audio/video program to be read from the record carrier to be or being read by said apparatus, which control means comprise a computer program controlled processor and the computer program comprises at least a first and a second control structure, of which the first structure defines play items of audio/video data that are playable in sequence and the second structure defines at least branching in the sequence of play items upon user input control.

The invention relates furthermore to a record carrier storing audio and/or video and control data, which control data enable playback control of the audio/video data wherein the control data are organized in a playback control mechanism, which comprises at least two control structures, of which a first structure defines play items of audio/video data that are playable in sequence and a second structure defines at least branching in the sequence of play items upon user input control.

A playback apparatus, such as an optical disc player and a record carrier such as an optically readable disc storing audio/video information are well known in the prior art under the names Video CD Player and Video CD Disc respectively. The Video CD Player comprises control means, which upon certain user command input reads control data from the Video CD Disc so as to realize functions such as "Playback", "NEXT", "PREVIOUS", "RETURN", "STOP" and controls playback of the relevant desired audio/video information accordingly.

Although the playback control of the Video CD System enables adequate playback control of the Video CD Discs the complexity of it increases if the number of play items that are added together so as to create a long uninterrupted sequence of display items, which are to be displayed.

Further the flexibility of well as interactivity during the playback are limited within the Video CD System. The complexity of the play back control will increase if more flexibility or interactivity in control is desired.

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It is an object of the invention to provide an apparatus having an improved control structure providing extended possibilities for reproducing audio/video information from record carriers.

It is a further object of the invention to provide an apparatus having improved interactive control possibilities for reproducing audio/video information from record carriers.

It is another object of the invention to provide a record carrier, on which have been stored control data so as to provide extended possibilities for playback of said audio/video information.

It is still a further object of the invention to provide a record carrier, on which have been stored control data, so as to provide an improved interactive playback control of the audio/video information of said record carrier.

It is still another object of the invention to provide an optical disc player and record carrier, which enable more possibilities and/or interactivity for control and still show a rather low degree of complexity in control software for the optical disc player and data file structure on the record carrier.

An optical disc player in accordance with the invention is characterized in that the first structure comprises a play list per single play item, which play list includes a seamless continus flag, which, if set, indicates that the end of the play item on the record carrier the next play item starts in the next sector of the record carrier, and that at least one of further control structures is provided, which is selected from the control structures: Regioned Play List, Statement List, Conditional List, Control List, Set Stream ID List, Enable Stream ID List, Change Volume List.

An optical readable disc in accordance with the invention is characterized in that the first structure comprises a play list per single play item, which play list includes a seamless continus flag, which, if set, indicates that the end of the play item on the record carrier the next play item starts in the next sector of the record carrier, and that at least one of further control structures is provided, which is selected from the control structures: Regioned Play List, Statement List, Conditional List, Control List, Set Stream ID List, Enable Stream ID List, Change Volume List.

This record carrier has the advantage that the record carrier enables seamless continuous play of successive items and the branching mechanism of the second structure can be simplified due to the fact that a play list comprises a single play item, said play list needs just to include one single offset data to find each time the list to execute the

previous Next or Return function respectively upon the user command inputs: Previous, Next or Return respectively.

The invention will be further elucidated and explained by use of the following drawings, which show various embodiments in a non-limitative way of example.

Now

Figure 1 shows an embodiment of an apparatus in accordance with the invention;

Figures 2a and 2b show the syntax of a first control structure: the Play List;

Figures 3a and 3b show the syntax of a control structure kindlike to the first control structure: the Regioned Play List;

Figures 4a and 4b show the syntax of a second control structure: the Selection List;

Figure 5 shows the syntax of the fourth control structure: the Statement List;

Figure 6 shows the syntax of a fifth control structure the Conditional List;

Figure 7 shows the syntax of the sixth control structure: the Control List;

Figures 8a, b and c show two further control structures: the Set Stream ID List and the Enable Stream ID List;

Figure 9 shows another embodiment of a control structure: the Change Volume List and

Figure 10 shows an embodiment of another control structure: the End List.

An optical disc player system 10 in accordance with the invention has been shown in Figure 1. The system 10 comprises a record carrier 1 and a record player 3. The record carrier 1 is e.g. an optical disc comprising digital audio/video/data information in an embossed information layer. This information is to be read out by use of an optical stylus 11 (known as such) which supplies the detected data to a decoding and error correcting means 13. The decoded and error corrected data are supplied to a processor 15, which cooperates with a ROM memory 15a and a RAM memory 15b to control and operate on the data flow received from decoding and error correcting means 13. A first task of the controller 15 is to provide control signals, such as velocity control tracking and focusing control signals to the servo system 16. The servo system 16 controls the angular velocity ω of the rotating disc 1 as well as the position of the optical stylus 11 with respect to the track

of the optical disc 1, which has been shown by the dotted arrow r. Further the servo system 16 controls the focusing of the optical stylus, such that the bright bundle emitted by the laser is focused on the information layer of the optical disc (which has been shown by the dotted arrow f).

A second task of the processor 15 is to control the audio and video bit stream to the dedicated decoders 21, which decode the e.g. MPEG2 coded video and audio and supply the decoded video to a display 23 and the decoded audio to a speaker or speaker system 25 (e.g. a multi channel sound system).

The information to be reproduced by the display 23 and sound system 25 is selectable by user input, which is received e.g. by direct control of selection buttons 19 of the input means 17 of the optical disc player 3 or via a remote control device 17a having selection buttons 19a. Of course, other possibilities of control are available and adequate, such as but not limited to: voice control, control via a direct link to a personal computer or via a telephone modem etc.

The processor 15 of the shown embodiment can be a relatively low power microcontroller having 1 MIPS capacity. It is possible to have the video and audio MPEG2 decoding realised by a software controlled processor 15, which then should be a high speed high power process unit equipped with adequate amounts of RAM and ROM memory 15a and 15b.

The syntax of the first control structure: the Play- List has been shown in Figure 2a. The Play List describes a part of a program that is to be played and comprises pointers to other control structures (lists), that will be executed on user interaction and when the end of a Play Item of the Play List concerned is realised.

The semantics of the Play List are as follows:

play_list_header: a one byte code that identifies the beginning of a Play List;

prev_list_offset: offset to the list to execute on the "Previous" function;

next_list_offset: offset to the list to execute on the "Next" function. In a Play List this field shall always contain a valid list offset;

return_list_offset: offset to the list to execute on the "Return" function;

wait_time: the time to wait at the end of the Play Item. When the seamless-continuous flag is set to one this field shall have the value zero. The numeric value of the Wait Time field is a measure for the number of seconds, during which a user can give input while the display item is displayed.

Seamless-Continue is a one bit flag and when set it indicates that at the end of the Play Item,

a next Play Item is to be displayed immediately and is located in the sector after the current Play Item.

There have been defined three Default Regions for the Play List. The displayed image is divided preferably in three equal widths regions each of full picture height. The regions are assigned to the functions "Previous", "Return" and "Next" and preferably reading from left to right. When a pointing device upon being positioned due to user input via input device 17 or remote controller 17a in one of said regions and activated the appropriate function will be performed.

The Play Item syntax has been shown in Figure 2b and is straight forward.

The Start Address is the logical sector address to start from so a to reproduce the information concerned.

The End Address is the logical sector address of the last sector in the Play Item.

The stopping STC will cause termination of the Play Item when the top 32 bits of the STC reach the value represented.

The syntax of a control structure kindlike to the Play List is shown in Figure 3a. The Regioned Play List is the same as a Play List but with the addition of regions. These regions are used to define areas of the picture as hotspots for navigation functions upon user input. These areas are preferably of rectangular shape.

The Regioned Play List Semantics are the same as those for the Play List, but the additions show the following:

prev_region(): an area on the screen representing a hotspot for the "Previous" function.

next_region(): an area on the screen representing a hotspot for the "Next" function.

return_region(): an area on the screen representing a hotspot for the "Return" function.

The Regions describe a rectangular area of the picture. The top left hand corner of the picture has e.g. the co-ordinates (0,0). The lower right hand corner of the picture has e.g. the co-ordinates (255,255).

Regions may overlap. In such situation the order in which regions appear in a list define their priority and the last region has preferably a higher priority than the first. If all fields in a region are set to zero, the region is inactive. If a list offset has the extreme value $FFFF its associated region shall be set to zero. If a list offset does not have the value $FFFF it associated region shall not be zero. The syntax to define a region has been shown in Figure

3b. The Region semantics are as follows:

top_left_x: the top left hand X co-ordinate of the region.
top_left_y: the top left hand Y co-ordinate of the region.
bottom_right_x: the bottom right hand X co-ordinate of the region.
bottom_right_y: the bottom right hand Y co-ordinate of the region.

A second control structure to cooperate with the Play List and Regioned Play List is the Selection List. Selection Lists are used to offer choices to the user and to take action based on the user's input. For instance, Selection Lists can be used to implement menus. The Selection List Syntax has been shown in Figure 4a. The Selection List Semantics are as follows:

selection_list_header: defines the start of a Selection List.
num_of_selections (NOS): the total number of selections in the list.
prev_list_offset: see Play List Semantics.
next_list_offset: see Play List Semantics. } (Figure 2a)
return_list_offset: see Play List Semantics
default_list_offset: offset to the list to execute on the "Default Selection" function.
timeout_list_offset: offset to the list to execute if there has been no user interaction after all the iterations of the Play Item and after the time defined in the wait_time field.
wait_time_: see Play List Semantics. } (Figure 2a)
seamless_continue: see Play List Semantics
jump-timing: defines how the Play Item is terminated when user chooses the "Default Selection" or a numeric selection is made. Values for this field are either 0 or 1: If the jump timing flag has the value 0, then terminate the Play Item immediately and execute the appropriate list. If the flag has the value 1 then wait for the current iteration of the Play Item to finish and then execute the appropriate list.

loop_count: the number of times to loop the Play Item. Values for loop_count are any number between and including 0 and 63. Thereby the value 0 means: infinite wait which is used to obtain e.g. a mandatory input of the user.
play_item(): see the definition of Play Item (Figure 2b).
prev_region(): a region of the picture representing a hotspot for the "Previous" function.

next_region(): a region of the picture representing a hotspot for the "Next" function.
return_region(): a region of the picture representing a hotspot for the "Return" function.
default_region(): a region of the picture representing a hotspot for the "Default Selection" function.
selection(): a selection option. This selection option is used to match user input, either in the form of numeric keypad selections or via a hotspots on the picture to a list. The Selection Syntax has been shown in Figure 4b.
The Selection Semantics are as follows:

value: the numeric value for this selection.
list_offset: offset to the list to execute when this selection is matched.
region(): the hotspot for this selection (see e.g. Figure 3b).

A fourth control structure is the Statement List, which is used to operate on variables. The Statement List Syntax is shown in Figure 5. The Statement List Semantics are as follows:
statement_list_header: identifies the start of a Statement List and the operation to be carried out on the operands.
operands: the operands for the operation defined by statement_list_header.
next_list_offset: offset to the next list to execute.

The variable to operate upon the Statement List are: user variables or system variables. The system variables can be a.o. is shown in the subsequent List.
Default country
Default language
Enhanced subtitle status
Simple subtitle status
LPCM audio status
MPEG-2 multi-lingual audio status
MPEG-2 extension audio status
MPEG base audio status
Rating status
Player capability
Calculation status
There are 32 user read-rewritable variables numbered 0-31. On start up all user variables are initialized to zero. User variables are signed quantities.

The System variables described the state of the playback system and provide a means to change that state. The Default Country variable holds the ISO 3166 country code for the default country of the player. If the default country is unknown or undefined this variable shall be set to zero. The Default Language variable holds the ISO639 code for the default language of the player. If the default language is unknown or undefined this variable shall be set to zero. The Elementary Stream Status variables describe information about each type of elementary stream. The Rating Status variable describes which rating definition levels, as defined in a disc Table of Content (TOC) have been enabled. The use of a TOC is known as such. When the Rating Status variable is set to one then this flag indicates that rating definition level is enabled for the player. If the enabled rating levels of the player are unknown or undefined this variable shall be set to zero.

The Player Capability variable describes the decoding capabilities of the player, such as:

display_type(): describes the type of displays that the player is capable of supporting e.g. PAL of NTSC.

enhanced_subtitle: when set to one this flag indicates the player is capable of decoding enhanced subtitle streams;

simple_subtitle: when set to one this flag indicates the place is capable of decoding simple subtitle streams;

lpcm_audio: when set to one this flag indicates the player is capable of decoding LPCM streams or that the player has a digital output for these streams;

mpeg_multilingual-audio: when set to one this flag indicates the player is capable of decoding MPEG-2 multi-lingual streams or that the player has a digital output for these streams;

mpeg-extension-audio: when set to one this flag indicates the player is capable of decoding MPEG-2 extension streams or that the player has a digital output for these streams.

The Calculation Status variable holds information about the result of the last arithmetic operation to be carried out by a Statement List. This result may be:

- overflow: if set to one this flag indicates there was an arithmetic overflow. This implies the result was not representable in the operand size; Cleared otherwise;
- carry; if set to one this flag indicates that a carry was generated out of the most significant bit of the operands for an addition. Also set if a borrow is generated in a substraction; Cleared otherwise.

The operation that can be carried out by the statement list include but are not limited to:

- comparisons

- assigning a value to a variable
- additions
- substraction
- multiply
- divide
- logic operation: OR; AND; EX-OR
- assigning random values to a variable
- modulus calculation

etc.

Another type of control structure is the Conditional List. Conditional Lists offer an "if-then-else" type of construction. A condition is tested and either a true or false list is executed. The Conditional List Syntax is shown in Figure 6. The Conditional List Semantics are as follows:

conditional_list-header: defines the start of a Conditional List and which type of condition to check;

operands: the operands for the condition as defined by conditional_list_header;

true_list_offset: offset to the list to execute if the condition is true;

false_list_offset: offset to the list to execute if the condition is false.

A further type of a control structure is the Control List. The Control List is used to select stream identifications and to enable and disable stream decoding. The Control List Synntax is shown in Figure 7. The Control List Semantics are as follows:

control_list_header: identifies the start of a Control List.

next_list_offset: offset to the next list to execute;

enhanced_subtitle: controls the decoding of enhanced subtitles;

simple_subtitle: controls the decoding of simple subtitles;

lpcm_audio: controls the decoding of LPCM audio;

mpeg_multi_lingual: controls the decoding of MPEG-2 multi-lingual audio

mpeg_multi_channel: controls the decoding of MPEG-2 multi-channel audio

mpeg_base_audio: controls the decoding of MPEG base stream audio.

The meaning of the control byte for each elementary stream type can be: channel select, Enable, Disable, No Action.

A further control structure is the Set Stream ID List. The Set Stream ID list is used to set the stream identification for an elementary stream from a variable. The Set Stream ID List Syntax is shown in Figure 8a.

The Set Stream ID List Semantics are given here below.

set_stream_id_list_header: identifies the start of a Set Stream ID list and which type of stream to set. The meanings of the values for this field can be as follows: Enhanced subtitle, Simple subtitle, LPCM audio, MPEG-2 multi-lingual audio, MPEG-2 extension audio or MPEG base audio.

variable_id: the variable to read the stream identification form;

next_list_offset: the offset to the next list to execute.

A control structure to be used in combination with the Set Stream ID List is the Enable Stream ID list. The Enable Stream ID List is used to set which streams are available for user selection. The Enable Stream ID List Syntax is shown in Figure 8b. The Enable Stream ID List Semantics is given herebelow:

enable_stream_id_list_header: identifies the start of an Enable Stream ID list and which type of stream the enable map applies to. How this field identifies stream types is given in the subsequent list: Enhanced subtitle, Simple subtitle, LPCM audio, MPEG-2 multi-lingual audio, MPEG-2 extension audio; MPEG base audio.

next_list_offset: offset to the next list to execute.

enable-map(): bitmap of which streams to enable.

The Enable Map Syntax is shown in Figure 8c. The Enable Map Semantics are as follows:

enable_steam_s: enable decoding of stream s.

Another embodiment of a control structure is the Change Volume List. The Change Volume List is used to instruct the player to switch to another disc within the current album. Such is necessary if the volume of information exceeds the quantity of information that can be stored on a single disc. The Change Volume List Syntax is shown in Figure 9. The Change Volume List Semantics are as follows:

change_volume_list_header: identifies the start of the Change Volume list.

loop_count: number of times to loop the Play Item, which can be a number between and including 0 and 255. The number 0 means an indefinite number of loops.

prev_list_offset: offset to the list to execute on the "Previous" function;

return_list_offset: offset to the list to execute on the "Return" function;

next_disc_num: sequence number of the destination disc within the album;

next_disc_list_offset: offset of the list to execute on the destination disc;

play_item(): this Play Item is played if the next disc is not found. This will happen in a single disc player or if the next disc is not in the tray of a multi-disc player.

A mandatory control structure is the End List. The End List signals the end of the playback control. The End List Syntax is shown in Figure 10. The End List Semantics are as follows:

end_list_header: identifies the start of an End List.

It has been shown by the above that by combination of several or all control structures a flexible and interactive control is achieved without creating too high level of complexity. A too high level is complexity would demand a processor 15 with more processing power, more software and the creation of a program on a disc also would be more demanding on effort in man and machine power.

CLAIMS:

1. An apparatus capable of reproducing audio and/or video and/or data information on a record carrier, on which the information has been stored in digital form and is directed accessible, the apparatus being provided with control means for enabling the user to select and control a presentation of an audio/video program to be read from the record carrier to be or being read by said apparatus, which control means comprise a computer program controlled processor and the computer program comprises at least a first and a second control structure, of which the first structure defines play items of audio/video data that are playable in sequence and the second structure defines at least branching in the sequence of play items upon user input control, characterized in that the first structure comprises a play list per single play item, which play list includes a seamless continus flag, which, if set, indicates that the end of the play item on the record carrier the next play item starts in the next sector of the record carrier.

2. A record carrier storing sectorwize audio and/or video and control data which control data enable playback control of the audio/video data, characterized in that the first structure comprises a play list, per single play item which play list includes a seamless continue flag indicating that at the end of the play item on the disc the next play item starts in the next sector of the record carrier and that at least one of further control structures is provided, which is selected from the control structures: Regioned Play List, Statement List, Conditional List, Control List, Set Stream ID List, Enable Stream ID List, Change Volume List.

3. A record carrier as claimed in Claim 2, characterized in that the playback control mechanism comprises a third control structure (the regioned play list), which is similar to the play list and further includes at least one region specification, which defines a user selectable area in an image of a display item under control of this third control structure and a user selectable function to be performed for the playback of audio/video data upon selection of said area, thereby each region defines a different function.

4. A record carrier as claimed in Claim 2 or 3, characterized in that the playback control mechanism comprises a further control structure (the Statement List) which is used to operate on variables being either system variables or user variables, the system

variables defining parameters and default settings for playback of the information on the record carrier.

5. A record carrier as claimed in Claim 4, characterized in that the system variables comprises at least one of the following items: Default Country Variable, Default Language Variable, Elementary Stream Variable, Rating Status Variable, Player Capability and Calculation Status Variable.

6. A record carrier as claimed in one of the Claims 2 to 5, characterized in that the playback control mechanism comprises another control structure (Conditional List), which causes to execute either a first or a second action upon either a first or second action upon the "true" or "false" result of a condition test.

7. A record carrier as claimed in one of the Claims 2 to 6, characterized in that the playback control mechanism comprises a still further control structure (Control List), which is used to select data stream identifications and to enable or disable said data stream decoding.

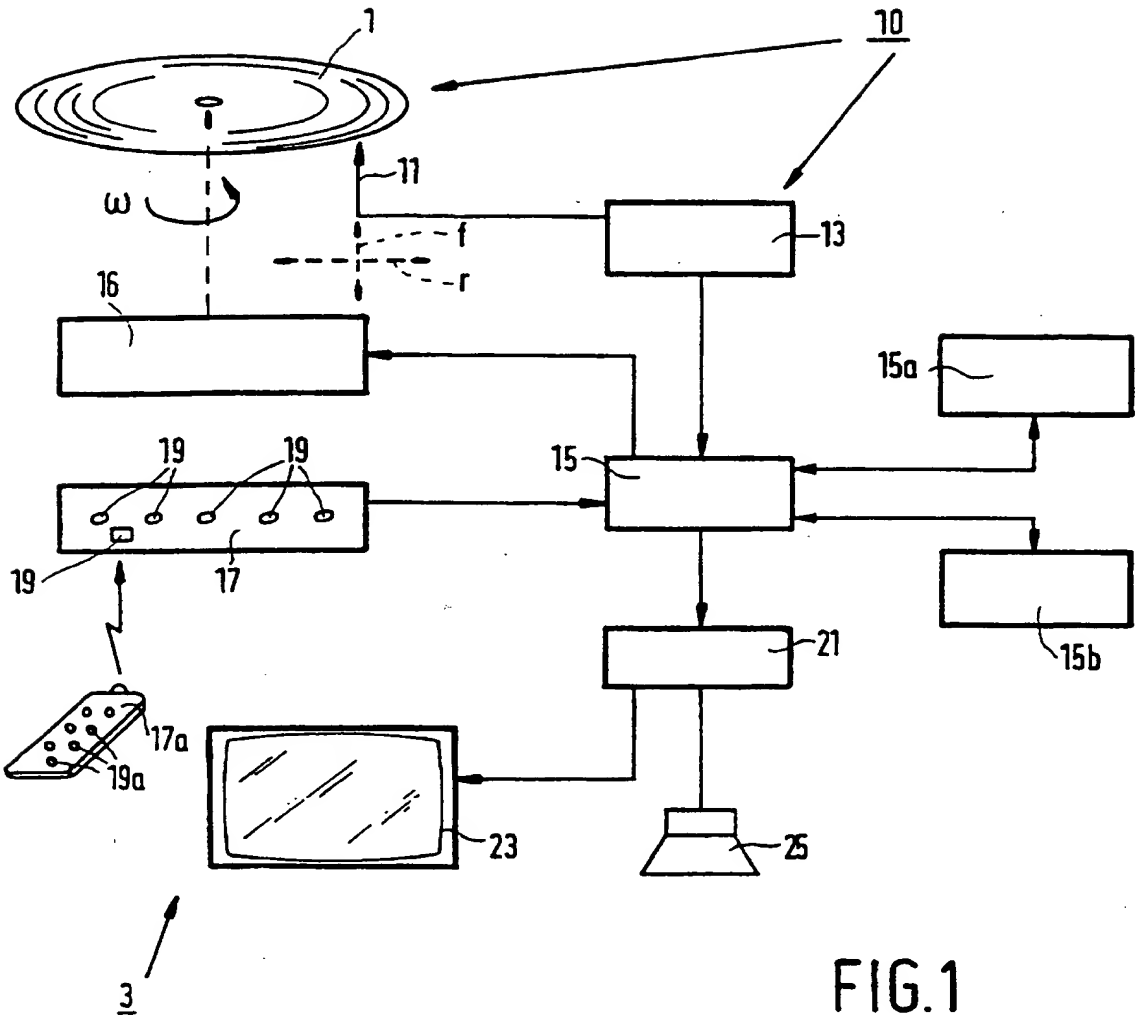

FIG.1

Syntax	No. of Bits
play_list(){	
play_list_header	8
prev_list_offset	16
next_list_offset	16
return_list_offset	16
wait_time	8
seamless_continue	1
reserved	7
play_item()	
}	

FIG.2 a

Syntax	No. of Bits
play_item(){	
start_address	32
end_address	32
stopping_stc	32
}	

FIG.2 b

Syntax	No. of Bits
play_list(){	
regioned_play_list_header	8
prev_list_offset	16
next_list_offset	16
return_list_offset	16
wait_time	8
seamless_continue	1
reserved	7
play_item()	
prev_region()	
next_region()	
return_region()	
}	

FIG.3 a

Syntax	No. of Bits
region(){	
top_left_x	8
top_left_y	8
bottom_right_x	8
bottom_right_y	8
}	

FIG.3 b

Syntax	No. of Bits
selection_list(){	
selection_list_header	8
num_of_selections (NOS)	8
prev_list_offset	16
next_list_offset	16
return_list_offset	16
default_list_offset	16
timeout_list_offset	16
wait_time	8
seamless_continue	1
jump_timing	1
loop_count	6
play_item()	
prev_region()	
next_region()	
return_region()	
default_region()	
for(s=0;s<NOS;s++){	
selection()	
}	
}	

FIG.4a

Syntax	No. of Bits
selection(){	
value	8
list_offset	16
region()	
}	

FIG.4b

Syntax	No. of Bits
statement_list(){	
statement_list_header	8
operands	32
next_list_offset	16
}	

FIG.5

Syntax	No. of Bits
conditional_list(){	
conditional_list_header	8
operands	24
true_list_offset	16
false_list_offset	16
}	

FIG.6

Syntax	No. of Bits
control_list(){	
control_list_header	8
next_list_offset	16
enhanced_subtitle	8
simple_subtitle	8
reserved	8
lpcm_audio	8
mpeg_multi_lingual	8
mpeg_audio_extension	8
mpeg_audio_base	8
}	

FIG.7

Syntax	No. of Bits
set_stream_id_list(){	
set_stream_id_list_header	8
variable_id	8
next_list_offset	16
}	

FIG.8a

Syntax	No. of Bits
enable_stream_id_list(){	
enable_stream_id_list_header	8
next_list_offset	16
enable_map()	
}	

FIG.8b

Syntax	No. of Bits
enable_map(){	
for(s=31;s>=0;s--){	
enable_stream_s	1
}	
}	

FIG.8c

Syntax	No. of Bits
change_volume_list(){	
change_volume_list_header	8
loop_count	8
prev_list_offset	16
return_list_offset	16
next_disc_num	16
next_disc_list_offset	16
play_item()	
}	

FIG.9

Syntax	No. of Bits
end_list(){	
end_list_header	8
}	

FIG.10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB 96/00875

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: G11B 27/10, G11B 27/32 // H04N 5/85
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: G11B, H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CLAIMS, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0689206 A1 (SONY CORPORATION), 27 December 1995 (27.12.95), page 5, line 49 - page 21, line 37	1,2
A		3-7
	--	
Y	EP 0528425 A2 (SONY CORPORATION), 24 February 1993 (24.02.93), column 3, line 16 - column 7, line 8	1,2
A		3-7
	--	
A	EP 0542377 A2 (PHILIPS ELECTRONICS UK LIMITED), 19 May 1993 (19.05.93), column 8, line 28 - column 14, line 5	1-7
	--	

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 May 1997	28 -05- 1997
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Bo Gustavsson Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB 96/00875

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0724264 A2 (KABUSHIKI KAISHA TOSHIBA), 31 July 1996 (31.07.96), column 11, line 23 - column 21, line 37	1-7

INTERNATIONAL SEARCH REPORT

Information on patent family members

20/05/97

International application No.
PCT/IB 96/00875

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0689206 A1	27/12/95	JP 60237605 A	26/11/85
		CN 1119896 A	03/04/96
		WO 9516262 A	15/06/95
EP 0528425 A2	24/02/93	JP 5054550 A	05/03/93
EP 0542377 A2	19/05/93	JP 5325499 A	10/12/93
		US 5301172 A	05/04/94
EP 0724264 A2	31/07/96	CA 2168327 A	31/07/96
		CN 1134583 A	30/10/96
		JP 8273304 A	18/10/96

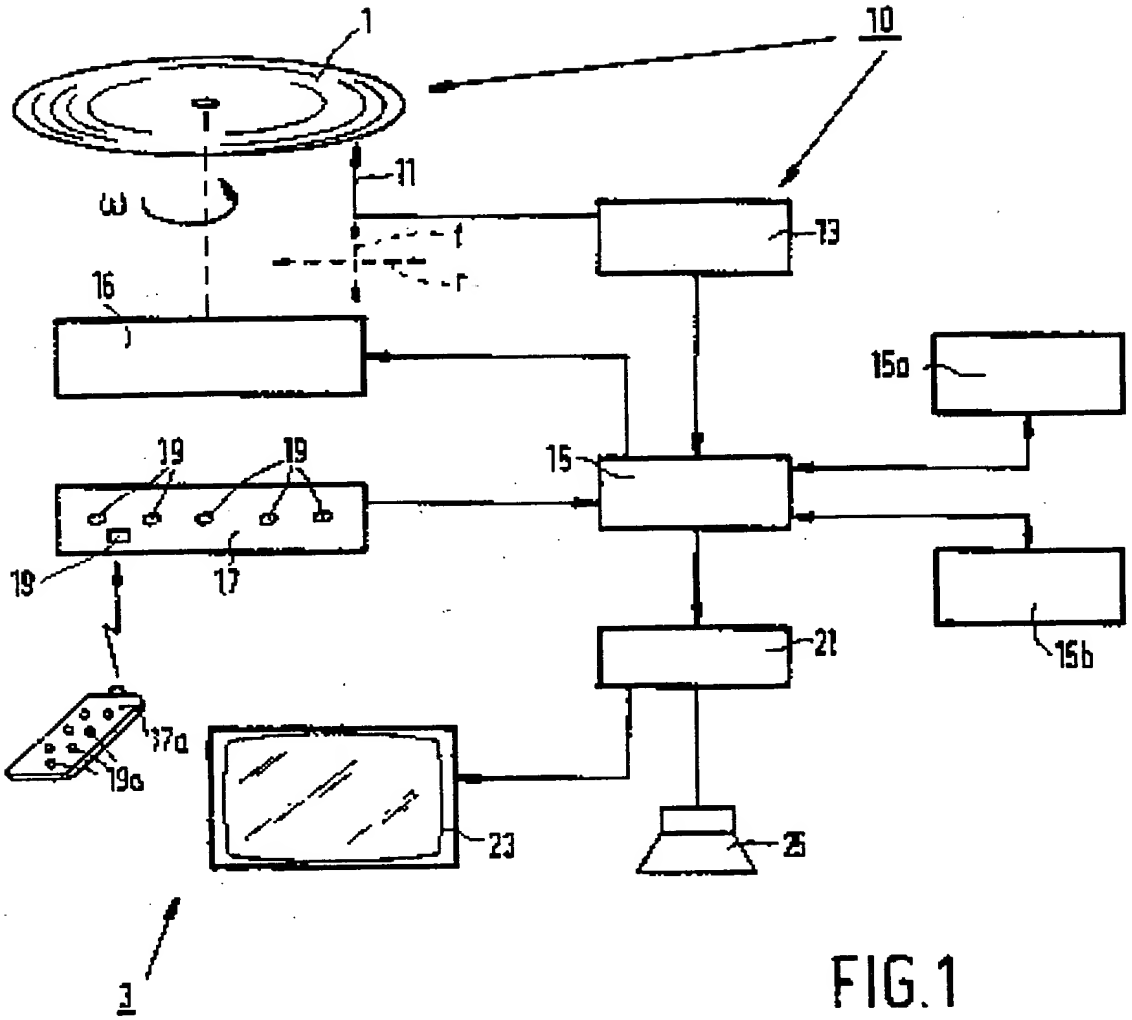

FIG.1

Syntax	No. of Bits
play_list(){	
play_list_header	8
prev_list_offset	16
next_list_offset	16
return_list_offset	16
wait_time	8
seamless_continue	1
reserved	7
play_item()	
}	

FIG.2 a

Syntax	No. of Bits
play_item(){	
start_address	32
end_address	32
stopping_stc	32
}	

FIG.2 b

Syntax	No. of Bits
play_list(){	
regioned_play_list_header	8
prev_list_offset	16
next_list_offset	16
return_list_offset	16
wait_time	8
seamless_continue	1
reserved	7
play_item()	
prev_region()	
next_region()	
return_region()	
}	

FIG.3 a

Syntax	No. of Bits
region(){	
top_left_x	8
top_left_y	8
bottom_right_x	8
bottom_right_y	8
}	

FIG.3 b

Syntax	No. of Bits
selection_list(){	
selection_list_header	8
num_of_selections (NOS)	8
prev_list_offset	16
next_list_offset	16
return_list_offset	16
default_list_offset	16
timeout_list_offset	16
wait_time	8
seamless_continue	1
jump_timing	1
loop_count	6
play_item()	
prev_region()	
next_region()	
return_region()	
default_region()	
for(s=0;s<NOS;s++){	
selection()	
}	
}	

FIG.4a

Syntax	No. of Bits
selection(){	
value	8
list_offset	16
region()	
}	

FIG.4b

Syntax	No. of Bits
statement_list(){	
statement_list_header	8
operands	32
next_list_offset	16
}	

FIG.5

Syntax	No. of Bits
conditional_list(){	
conditional_list_header	8
operands	24
true_list_offset	16
false_list_offset	16
}	

FIG.6

Syntax	No. of Bits
control_list(){	
control_list_header	8
next_list_offset	16
enhanced_subtitle	8
simple_subtitle	8
reserved	8
lpcm_audio	8
mpeg_multi_lingual	8
mpeg_audio_extension	8
mpeg_audio_base	8
}	

FIG.7

Syntax	No. of Bits
set_stream_id_list(){	
set_stream_id_list_header	8
variable_id	8
next_list_offset	16
}	

FIG.8a

Syntax	No. of Bits
enable_stream_id_list(){	
enable_stream_id_list_header	8
next_list_offset	16
enable_map()	
}	

FIG.8b

Syntax	No. of Bits
enable_map(){	
for(s=31;s>=0;s--){	
enable_stream_s	1
}	
}	

FIG.8c

Syntax	No. of Bits
change_volume_list(){	
change_volume_list_header	8
loop_count	8
prev_list_offset	16
return_list_offset	16
next_disc_num	16
next_disc_list_offset	16
play_item()	
}	

FIG.9

Syntax	No. of Bits
end_list(){	
end_list_header	8
}	

FIG.10